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Problem Chosen

**A**

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**2015 Mathematical Contest in Modeling (MCM) Summary Sheet**

(Attach a copy of this page to your solution paper.)

Type a summary of your results on this page. Do not include the name of your school, advisor, or team members on this page.

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[TITLE]

## 1 Introduction

Academic success among undergraduate students at universities in the U.S. depends on several factors such as teacher capability, class size, and university funding. However, a well-funded institution is more advantaged in providing resources to its students than a university lacking adequate funds. Additional resources that are readily available to the student have been shown to increase student performance across the board.[?] The Goodgrant Foundation seeks to provide monetary grants to certain institutions with the goal to increase academic success among students at these universities.

Perhaps more information here about the paper I cite in the previous paragraph. Student success studies related to fund results j—not really a sentence but ya know

The Goodgrant Foundation wants its dollars to be allocated in such a way that students benefits are maximized, but to do so in the same manner and focus of other large grant-awarding foundations would be redundant.

Thus, we created a model that manages several considerations for the Goodgrant Foundation.

- + The model ranks all universities according to their current available funds due to outside donations each year in addition to how each university employs those funds. Universities with relatively small donation pools and a loyal history of fund allocation to expansion of student resources receive high rankings.
- + The model approximates the amount of effective change it can induce by giving funds to schools of various rankings. The schools with optimized rates of changes will receive the largest grants from the Foundation.
- + The size of grant awarded to each school in the list will be determined by XXXXXXXX.
- + Over a period of five years, the foundation will award each grant according to a predictive distribution of optimal funding per year at each institution. This data comes from published financial data regarding university donation spending.

## 2 Assumptions

These are some things we assumed in order to create our model!

## 3 Formal Prolegomena

First, some notational definitions. We have tabulated them below.

( $\mathcal{U}$ ) The set of universities and colleges in question.

- ( $\mathcal{D}$ ) The space of donations – this might have multiple dimensions over  $\mathbb{R}$ , depending on the specific categories of money we’re interested in.
- ( $\mathcal{T}$ ) The space of times for which we have data. We will also be interested in a “sliding window” of times trailing a given time; if  $t \in \mathcal{T}$ , we’ll denote this window as  $\mathcal{W}_n(t)$ , where  $n$  is the size of the window.
- ( $\mathcal{V}$ ) The vector space of student metric variables  $\{v_i\}$ . Note that at this point, we have not yet committed ourselves to any such choice of variables, and so  $\mathcal{V}$  includes also negative and neutral indicators of success.
- ( $d\mathcal{V}$ ) The 1-form of

With this framework, we can now formulate the problem more precisely. To do any kind of induction at all, it is necessary to make some commonplace but sometimes very wrong independence assumptions (see Hume). Here’s ours: we will assume that the effectiveness with which an institution can use money does not change over time<sup>1</sup>. We can now talk about the effect of donor money over time on the variables in  $\mathcal{V}$  as a mapping

$$F : \mathcal{D} \times \mathcal{W}_n \rightarrow \mathcal{V} \tag{1}$$

that predicts the

## 4 Hello

Other things

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<sup>1</sup>This is a reasonable assumption to make; while technically invalid, it seems very natural to judge an institution by its past performance – indeed, this is the best we can hope for from a dataset